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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/619,556	07/16/2003	Greg Parker	553-74	5931
23117	7590	12/01/2005	EXAMINER	
NIXON & VANDERHYE, PC 901 NORTH GLEBE ROAD, 11TH FLOOR ARLINGTON, VA 22203			PAK, SUNG H	
			ART UNIT	PAPER NUMBER
			2874	

DATE MAILED: 12/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/619,556	Applicant(s) PARKER ET AL.	
	Examiner Sung H. Pak	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 09 September 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION**

Applicants' amendment filed 9/9/2005 has been entered. All pending claims have been carefully reconsidered in view of the amendment.

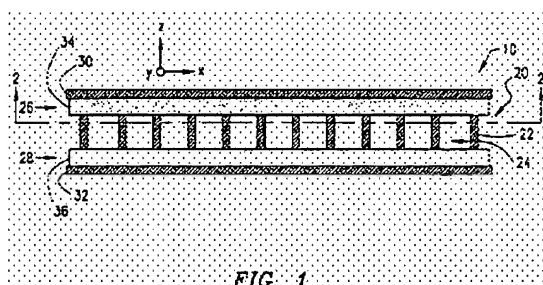
***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 5-6, 8-15, 19-20, 22-24, 26-28, 30-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Sigalas et al (US 6,560,006) as indicated in the previous office action.



Sigalas discloses an optical device with all the limitations set forth in the claims, including: a photonic crystal waveguide comprising a core layer (composed of air slab body and rods- column 4 lines 17-25; '20' Fig. 1) having a first refractive index  $n_{\text{core}}$  (the effective refractive index of the core layer is determined by the refractive index of air slab body and the refractive index of dielectric rods); array of sub-regions within the core layer having a second

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refractive index  $n_{\text{rods}}$  ('22' Fig. 1); wherein the sub-regions are formed from silicon (column 4 lines 19-20), and the sub-region gives rise to a photonic bandgap (column 1 lines 14-25). Since the core layer is composed of air slab body (which has a refractive index of 1) and silicon rods (which have refractive indexes of 3-4, column 6 line 3),  $n_{\text{rods}}$  is necessarily greater than the effective refractive index of the entire core layer  $n_{\text{core}}$  by at least 0.1.

Sigalas also discloses the waveguide structure being a planar waveguide structure (Fig. 1); the core layer being formed between a cladding layer (i.e. upper cladding '26' Fig. 1) and a buffer layer (i.e. lower cladding '28' Fig. 1); wherein the refractive indexes of the cladding and the buffer layers are less than  $n_{\text{core}}$  (column 6 lines 8-12); wherein the cladding layer is formed from silicon dioxide (column 4 line 53); wherein the array of sub-regions are arranged in a square lattice (Fig. 2); wherein the core layer includes a waveguiding region having no sub-regions, and wherein the waveguiding region includes a bend (Fig. 4); wherein the sub-regions extend through the cladding layer and into the buffer layer (Fig. 10g, '105'-cladding layer, '103 + 112'-buffer layer; column 7 lines 50-51). Since the sub-region in the cladding layer is composed of cladding layer material, its refractive index is the same as the cladding layer which is less than the refractive index of the core layer.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cotteverte et al (US 6,542,682 B2).

Cotteverte discloses an optical device and a method of forming such a device with nearly all the limitations set forth in the claims. Although, Cotteverte states that plurality of holes may be filled with material having substantially different refractive index than the cladding or core material, it does not explicitly teach the refractive index of the filling material being greater than that of the core layer.

Nevertheless, Cotteverte does disclose: method of providing a core layer having a first refractive index ('102' Fig. 14); providing cladding layer ('106' Fig. 14); providing a buffer layer ('104' Fig. 14); cladding and buffer layers being located adjacent to the core layer, on either sides of the core layer (Fig. 14); where  $n_{\text{core}} > n_{\text{cladding}}$  and  $n_{\text{buffer}}$  (column 8 lines 1-6); forming plurality of contiguous holes in the cladding, core and buffer layers (Fig. 14, column 8 lines 41-44); wherein the holes are filled with a material having refractive index substantially different than the bulk material (column 8 lines 41-44).

On the other hand, providing filling material in the photonic crystal holes with material having refractive index higher than the core layer is well known in the art. Such refractive index is considered advantageous in the art because it enhances photonic bandgap effect and provides efficient optical wave confinement (i.e. low loss). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the device of Cotteverte to have filling material having refractive index higher than the core layer.

### ***Response to Arguments***

#### Claims 1-2, 5-6, 8-15, 19-20, 22-24, 26-28, 30-32:

Starting on page 12 of the applicant's response, it is argued that Sigalas fails to show "...the sub-regions in the cladding area [that] are contiguous with the sub-regions in the core layer" as claimed in the amended claim 1 (page 12, paragraph 5). Further it is argued that Fig. 10g of Sigalas does not show contiguous nature of the sub-regions (page 13, first full paragraph).

The examiner respectfully submits that Fig. 10 of Sigalas clearly shows the sub-regions in the cladding layer (layer '105') and sub-regions in the core layer (layer '110') being contiguous (i.e. touching or connected throughout in an unbroken sequence). As correctly noted by the applicants, the Sigalas device is fabricated by etching away material in the core and the cladding layers to leave behind the sub-regions (page 13, first full paragraph). As such the sub-regions in the cladding layer and the core layers necessarily are contiguous, since the cladding

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layer and core layers are contiguous layers in the beginning of the fabrication steps (see also Fig. 10a).

Moreover, applicants argue that “Sigalas device is fabricated by etching away material in the core and the cladding layers... As a consequence, the material forming the core and the cladding layers, and therefore, its refractive index, is the same.” (page 13, first full paragraph).

The examiner respectfully submits that this is NOT true. In column 7 lines 16-30, Sigalas clearly describes one of the embodiments in which the core layer is formed from GaAs material, and the cladding layer formed from AlGaAs material before the etching process. As is well known in the art, GaAs core material exhibits around 3.66 refractive index values, where as AlGaAs exhibits around 3.3 refractive index values. Therefore, Sigalas fully anticipates the claimed limitations of claim 1 (i.e. “a cladding layer, said cladding layer located adjacent said core layer, said cladding layer having a third refractive index,  $n_{\text{cladding}}$ , where  $n_{\text{core}} > n_{\text{cladding}}$ ” - claim 1).

For these reasons, the claim rejection provided in the office action is proper.

Claims 3,4,21,25,29 and 33; Claim 7:

Since the claim rejection based on Sigalas reference is proper as discussed above, the ground of rejection provided for these claims is also proper.

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Claims 16-18:

In view of the amended limitations incorporated into these claims, a new ground of rejection is provided for these claims.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action (for claims 16-18). Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

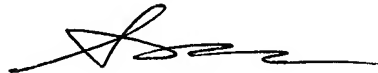
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571)272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sung H. Pak  
Primary Patent Examiner  
Art Unit 2874